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A study on biology student teachers' conceptions of learning

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Abstract

The purpose of this study is to investigate biology student teachers' conceptions of learning. This study focuses on the following question: How do biology student teachers conceptualize the term "learning"? A total of 86 biology students, who were studying to become secondary biology teachers at the education faculty of a university in Turkey, participated in this study. To reveal participating students' conceptions of learning they were asked to answer the open-ended question: ''What is learning?''. Data obtained from the question was analyzed and the frequencies of the responses were classified in six categories. The results of this study have shown that the variation of participating students' conceptions of learning includes all of six conceptions of learning identified originally by Marton et al. (1993). Participants focused mainly on the conceptions of learning as the increase of knowledge and learning as the acquisition of facts or procedures. These results are compared with related literature and recommendations are provided.

Keywords: Biology students; learning conception; learning approach.

1. Introduction

The teacher has an important role in achieving effective biology education in schools. It is essential that an active biology teacher possess the abilities, skills and formation knowledge that will be needed throughout his/her career. Therefore, instead of procedural learning and surface approaches, conceptual learning that encourages deep approaches to learning should be given priority. Teachers' and students' conceptions of learning influence educational outputs. This influence has been revealed in previous studies on higher education (Entwistle, Skinner, Entwistle, & Orr, 2000; Marton, Beaty, & Dall'Alba, 1993; Tsai, 2004; Vermunt & Vermetten, 2004; Virtanen & Lindblom-Ylänne, 2009**).**

According to Saljo (1979) and Marton, et al., (1993), students' learning conceptions could be classified as one of the following: (1) learning as the increase of knowledge, (2) learning as memorizing, (3) learning as the acquisition of facts or procedures, (4) learning as the abstraction of meaning, (5) learning as an interpretative process aimed at the understanding of reality, and (6) learning as changing as a person. Some of these learning conceptions may reflect deep approaches (e.g. learning as the abstraction of meaning) while some reflect surface approaches (e.g.

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learning as the increase of knowledge) (Boulton-Lewis, Brownlee, Berthelsen, & Dunbar, 2008; Virtanen & Lindblom-Ylänne, 2009).

Students' learning conceptions are important factors, as the learning conception of a student influences his/her approach to learning with regard to the quality of learning outcomes (Trigwell & Prosser, 1996). Students with less developed conceptions use surface approaches, and in the end, only reach a superficial level of understanding. In contrast, students with sophisticated conceptions of learning adopt deep approaches and achieve a deep level of understanding (Byrne & Flood, 2004). Virtanen and Lindblom-Ylänne (2009) compared university teachers' and first-year students' conceptions of teaching and learning in Environmental and Biological Sciences. The results of this study showed that at the beginning of studies the gap between teachers' and students' conceptions of teaching and learning is substantial. Tsai (2004) studied conceptions of learning science among high school students in Taiwan. The results of this study revealed seven categories of conceptions of learning science, including: learning science as memorizing, preparing for tests, calculating and practising tutorial problems, the increase of knowledge, applying, understanding, and seeing in a new way. Boulton-Lewis et al. (2008) studied students' conceptions of learning in a vocational education course for child-care work. In this study, all six categories of conceptions of learning were found. However, more than 50% of the conceptions were at level A (increasing knowledge).

Knowing the student teachers' conceptions of learning is one of the key factors in taking meaningful educational precautions for the future, since today's student teachers are the teachers and policy-makers of tomorrow in education area. In this regard, it is essential to conceive biology student teachers' conceptions of learning.

The purpose of this study is to investigate biology student teachers' conceptions of learning. This study focuses on the following question: How do biology student teachers conceptualize the term "learning"?

2. Methodology

2.1. Participants

A total of 86 biology students from the Education Faculty of a University in Turkey who were studying to become secondary school biology teachers participated in this study. The average age of the students was 21.9 years (range 19–25). The majority of the students were female (51 of 86). However, this study was not focused on gender differences. The participants are senior post-graduate biology students and have received theoretical knowledge on learning through courses such as development and learning. The study was conducted in June 2009.

2.2. Data Collection

In order to establish the student teachers' conceptions of learning, each one was asked to respond to the following open question: "What is learning? Please explain." The participants were given approximately 15 minutes to write down what learning meant. As the intent was to benefit from the first ideas to come to the minds of the student teachers, this time was considered sufficient. The open question given above is the basic data source for this study.

2.3. Data Analysis

In the first stage, the 86 participants were asked to write down what they thought learning meant. However, only 82 of these participants wrote down valid answers. The answers of the other four participants were excluded, because these participants emphasized the general aims of education instead of the meaning of learning. As a result, data analysis was carried out on 82 papers. Qualitative content analysis method (Yildirim & Simsek, 2005) was used for the analysis of data. A summary of the analysis process in this study was as follows: (1) All answers were read independently by both researchers in order to define all variations of the concept of learning and to roughly establish categories, (2) After the first reading, both researchers classified the interpreted conceptions and created starter groups, (3) Then, the two researchers discussed and agreed on the starting groups, (4) After the discussion, both researchers read the answers again to establish the main categories, (5) The main categories defined by each researcher were discussed until both researchers agreed on them. The researchers then continued to analyze the data, (6) The process of repeated reading and discussing continued until both researchers reached a 100% agreement on

the categories. Many studies have shown this type of data analysis technique provides reliable results (Marton et al., 1993; Saljo, 1979; Sharma, 1997; Virtanen & Lindblom-Ylänne, 2009).

3. Results

The students' definition of learning was grouped in six categories (Table 1). Learning as the increase of knowledge was the dominant category (31.7%).

Table 1. Categorization of the biology student teachers' conceptions of learning

Conception		n	%
1	learning as the increase of knowledge	26	31.7
2	learning as memorizing	8	9.8
3	learning as the acquisition of facts or procedures	18	22.0
4	learning as the abstraction of meaning	12	14.6
5	learning as an interpretative process aimed at the understanding of reality	7	8.5
6	learning as changing as a person	11	13.4
	Total	82	100

Conception 1: learning as the increase of knowledge

In this category, the students focused on the conception of learning as the increase of knowledge (31.7 %). For example:

"Learning is a person's implementation of his current accumulation of knowledge, using various resources. Thus, a person's accumulation of knowledge increases daily" (Student 45).

"In my opinion, learning is collecting information on a certain subject and increasing one's knowledge on that subject …" (Student 3).

"It is the process of accumulating specific knowledge on a theory or a formula …" (Student 76).

Conception 2: learning as memorizing

In this category, students focused on the conception of learning as memorizing (9.8%). For example:

"In my opinion, learning is recording concepts in our minds without remaining dependent on any method. Learning is achieved by the storing of information from visual and written sources in the human brain …" (Students 33).

"Learning is the gathering of information, rereading the information, memorizing and repeating when necessary, in order to be successful in a certain subject or at an exam …" (Student 58).

Conception 3: learning as the acquisition of facts, procedures etc., which can be retained and/or used in practice

In this category, students focused on the conception of learning as the acquisition of facts or procedures (22%). For example:

"Learning is acquiring knowledge, and using this knowledge properly for the solution of problems encountered in daily life …" (Student 64).

"Learning is the acquisition of new knowledge, and the implementation of this knowledge when necessary under various circumstances …" (Student 27).

Conception 4: learning as the abstraction of meaning

In this category, students focused on the conception of learning as the abstraction of meaning (14.6%). For example:

"Learning is acquiring information about unknown phenomena, and discovering the correct answers to the questions about that phenomenon. A person can develop a solution to a specific problem through learning …" (Student 11).

"In my opinion, learning is a person's attempt to understand the meaning of nature, to question real world events and to add meaning to the events around him with his present knowledge …" (Student 28).

Conception 5: learning as an interpretative process aimed at the understanding of reality

In this category, students focused on the conception of learning as an interpretative process aimed at the understanding of reality (8.5%). For example:

"Learning is a lifelong process. Throughout this process, we add new knowledge onto our existing knowledge, and restructure our conceptions. In this way, we develop new skills and new understanding …" (Student 71).

Conception 6: learning as changing as a person

In this category, students focused on the conception of learning as changing as a person (13.4%). For example:

"People learn new things each day. In my opinion, learning is the change and development in a person's personality, experiences and perspective on life …" (Student 40).

4. Discussion and conclusions

The results show that the learning conceptions of the biology student teachers cover all the variations of the six categories identified originally by Saljo, (1979), and Marton, et al., (1993). A new conception of learning outside these six has not been encountered. Participants focused mainly on the concepts of learning as the increase of knowledge and learning as the acquisition of facts or procedures. The results show that the participants do not have the same opinions on their view of learning. The participants' consideration of learning as the increase of knowledge and, furthermore, as memorizing, is not desirable, as learning conceptions and learning approaches are closely related. Learning conceptions defined as the increase of knowledge and memorizing are closely associated with the surface approach. On the other hand, learning according to the deep approach means understanding and interpreting reality, constructing generalizations for new conditions and gaining the ability to think in the abstract. In many aspects, the results of this study corroborate the results of studies conducted previously on the learning conceptions of students of many different disciplines (Boulton-Lewis et al., 2008; Byrne & Flood, 2004; Sharma, 1997; Tsai, 2004; Virtanen & Lindblom-Ylänne, 2009).

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